REMARKS

Claims 1-7, 9-14 and 16-24 are pending in this application. Claims 12, 19 and 24 have been amended. Claim 23 has been cancelled.

Claims 1-7, 9-14 and 16-24 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Chen et al. (U.S. Patent No. 5,482,881) ("Chen"). This rejection is respectfully traversed.

The claimed invention relates to a method of forming a source pocket on a substrate. As such, independent claim 1 recites a "method of forming a plurality of dopant pockets on a substrate" by *inter alia* "forming a plurality of implantable regions on said substrate separated by field oxide regions" and "forming a plurality of word lines located over said implantable regions and field oxide regions." Independent claim 1 also recites "removing portions of said field oxide regions between two adjacent word lines to expose respective substrate regions" and "forming source regions in said implantable regions." Claim 1 further recites "subsequently implanting a dopant into said substrate through said respective substrate regions to form said dopant pockets beneath said source regions."

Amended independent claim 12 recites a "method of forming a plurality of dopant pockets on a substrate" by *inter alia* "forming a plurality of implantable regions on said substrate separated by field oxide regions, said implantable regions and field oxide regions extending in a first direction" and "forming a plurality of word lines located over said implantable regions and field oxide regions, said word lines extending in a second direction perpendicular to said first direction." Amended independent claim 12 also recites "implanting a dopant into said substrate through said respective substrate regions to form said dopant pockets beneath said source regions, said photoresist operating as a mask for forming said source regions and said dopant pockets, wherein said act of implanting said dopant into said substrate is carried out before said act of forming said source regions."

Amended independent claim 19 recites a "method of forming source regions with boron pockets on a substrate of a flash memory" by *inter alia* "forming a pair of

adjacent spaced word lines" and "forming a layer of photoresist over...said word lines." Amended independent claim 19 also recites the steps of "patterning said photoresist to expose a portion of said field oxide layer located between said word lines," and "implanting boron into said substrate in between said word lines to form a boron pocket beneath said source region, said photoresist operating as a mask for forming said source region and said boron pocket, wherein the act of implanting boron into said substrate is carried out before said act of forming said source region."

Amended independent claim 24 recites a "method of forming a source region in a substrate" by *inter alia* "forming a pair of gate structures which extend in a first direction over a substrate" and "providing a layer of photoresist over said pair of gate structures." Amended independent claim 24 also recites "providing a second doped layer in said substrate between said pair of gate structures which is below said first doped layer and which has a profile which follows that of said first doped layer, *said photoresist operating as a mask for providing said first doped layer and said second doped layer*, wherein said act of providing said second doped layer is carried out with an implanting energy higher than an implanting energy for said first doped layer and wherein said second doped layer is provided in said substrate before said first doped layer." (emphasis added)

Chen relates to a "flash EEPROM having reduced column leakage current." (Abstract). Chen teaches that "[S]ource 112 and drain 114 regions . . . are conventionally formed by initially implanting n-type dopants with a conventional double diffusion implant (DDI) . . . to form a deeply diffused but lightly doped N well 130." (Col. 6, lines 55-63; Figures 1 and 4B). Chen also teaches that "[A] shallow second implant, commonly referred to as a medium diffused drain (MDD) implant, is then performed (e.g. with arsenic) . . . to create a more heavily doped, but shallower, n+ well 132 embedded within deep N well 130." (Col. 6, lines 55-63; Col. 7, lines 1-5; Figures 1, 4B, 4D).

The subject matter of claims 1-7, 9-14 and 16-24 would not have been obvious over Chen. Indeed, the Office Action fails to establish a *prima facie* case of obviousness. Courts have generally recognized that a showing of a *prima facie* case of obviousness necessitates three requirements: (i) some suggestion or motivation, either in the references

themselves or in the knowledge of a person of ordinary skill in the art, to modify the reference or combine the reference teachings; (ii) a reasonable expectation of success; and (iii) the prior art references must teach or suggest all claim limitations. See e.g., In re Dembiczak, 175 F.3d 994, 50 U.S.P.Q.2d 1614 (Fed. Cir. 1999); In re Rouffet, 149 F.3d 1350, 1355, 47 U.S.P.Q.2d 1453, 1456 (Fed. Cir. 1998); Pro-Mold & Tool Co. v. Great Lakes Plastics, Inc., 75 F.3d 1568, 1573, 37 U.S.P.Q.2d 1626, 1630 (Fed. Cir. 1996).

In the present case, Chen does not teach or suggest "implanting a dopant into said substrate through said respective substrate regions to form said dopant pockets beneath said source regions, *said photoresist operating as a mask for forming said source regions and said dopant pockets*, wherein said act of implanting said dopant into said substrate is carried out before said act of forming said source regions," as amended independent claim 12 recites. Chen specifically teaches that the n+ well 132, which would arguably correspond to the source region of the claimed invention, is a shallow layer which is "embedded within deep N well 130," which would arguably correspond to the dopant pocket of the claimed invention. (Col. 7, lines 1-5; Figure 4D). Chen also specifically teaches that *mask 710 is removed prior to* a second implant and formation of n+ well 132. (Figs. 4, 4A-4D, 6, 6D-6F, 8, and 8C-8F). Thus, Chen clearly teaches *away from* the claimed invention according to which the photoresist operates as a "mask for forming said source regions *and* said dopant pockets." (emphasis added). Accordingly, the formation of the flash structure containing *both* wells 130 and 132 could not have been carried out in the presence of photomask, since Chen explicitly teaches removal of the photomask prior to formation of the flash structure containing *both* wells 130 and 132.

Chen also fails to teach or suggest all limitations of independent claims 1 and 13. Chen does not teach or suggest "forming source regions in said implantable regions" and "subsequently implanting a dopant into said substrate through said respective substrate regions to form said dopant pockets beneath said source regions," as independent claim 1 recites. Chen teaches that the source region 112 is formed by "initially implanting n-type dopants with a conventional double diffusion implant (DDI) to form a deeply diffused but lightly doped N well 130" and then conducting "[A] shallow second implant . . . to create

a more heavily doped, but shallower, n+ well 132 embedded within deep N well 130." (Col. 6, lines 55-63; Col. 7, lines 1-5; Figures 1, 4B, 4D). Thus, Chen does not teach the step of "subsequently implanting a dopant into said substrate . . . to form said dopant pockets beneath said source regions," as independent claim 1 recites. In fact, even if *arguendo* the deep N well 130 of Chen would be considered a source region, Chen teaches forming "n+ well 132 embedded within deep N well 130," and not "subsequently implanting a dopant into said substrate . . . to form said dopant pockets beneath said source regions," as in the claimed invention.

Similarly, Chen fails to teach or suggest the limitations of independent claim 13. Chen is silent about "forming a source region in between said word lines" and "subsequently implanting *boron* into said substrate in between said word lines," much less about implanting boron into said substrate "to form a boron pocket *beneath* said source region," as independent claim 13 recites. Chen teaches only that "[S]ource 112 and drain 114 regions . . . are conventionally formed by . . . implanting n-type dopants." (Col. 6, lines 55-63; Figures 1 and 4B). Chen is silent, however, about any dopant implantation subsequent to the formation of the source/drain regions and beneath the source/drain regions, much less about p-type dopant implantation, such as boron implantation, "to form a boron pocket *beneath* said source region," as independent claim 13 recites. For at least these reasons, the Office Action fails to establish a *prima facie* case of obviousness and withdrawal of the rejection of claims 1-7, 9-14 and 16-24 is respectfully requested.

A marked-up version of the changes made to the specification and claims by the current amendment is attached. The attached page is captioned "**Version with markings to show changes made.**"

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue.

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Respectfully submitted,

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Version With Markings to Show Changes Made

12. (Twice Amended) A method of forming a plurality of dopant pockets on a substrate comprising:

forming a plurality of implantable regions on said substrate separated by field oxide regions, said implantable regions and field oxide regions extending in a first direction;

forming a plurality of word lines located over said implantable regions and field oxide regions, said word lines extending in a second direction perpendicular to said first direction;

forming a layer of photoresist over said field oxide regions and over said plurality of word lines;

patterning said photoresist to expose portions of said field oxide regions between said word lines;

removing portions of said field oxide regions between [two] adjacent word lines to expose respective substrate regions;

forming source regions in said implantable regions; and

implanting a dopant into said substrate through said respective substrate regions to form said dopant pockets beneath said source regions, said photoresist operating as a mask for forming said source regions and said dopant pockets, wherein said act of implanting said dopant into said substrate is carried out before said act of forming said source regions.

19. (Twice Amended) A method of forming source regions with boron pockets on a substrate of a flash memory, said method comprising:

forming a field oxide layer over said substrate;

forming a pair of adjacent spaced word lines over said field oxide layer;

forming a layer of photoresist over said field oxide layer and over said word lines;

patterning said photoresist to expose a portion of said field oxide layer located between said word lines;

removing said field oxide layer from predefined regions located in between said spaced word lines to expose respective substrate regions;

forming a source region in between said word lines; and

implanting boron into said substrate in between said word lines to form a boron pocket beneath said source region, said photoresist operating as a mask for forming said source region and said boron pocket, wherein the act of implanting boron into said substrate is carried out before said act of forming said source region.

24. (Twice Amended) A method of forming a source region in a substrate comprising:

forming a pair of gate structures which extend in a first direction over a substrate;

altering the upper surface profile of said substrate to form alternating areas of higher substrate surface elevation and areas of lower substrate surface elevation along said first direction and between said pair of gate structures;

providing a layer of photoresist over said pair of gate structures;

patterning said photoresist to expose a portion of said substrate located between said pair of gate structures;

providing a first doped layer in said substrate between said gate structures which has a profile which follows that of said upper surface profile; and

providing a second doped layer in said substrate between said pair of gate structures [structure] which is below said first doped layer and which has a profile which

follows that of said first doped layer, said photoresist operating as a mask for providing said first doped layer and said second doped layer, wherein said act of providing said second doped layer is carried out with an implanting energy higher than an implanting energy for said first doped layer and wherein said second doped layer is provided in said substrate before said first doped layer.